

# Institute for Computer Sciences & Technology

**The Institute for Computer Sciences and Technology is one of the four institutes comprising the National Bureau of Standards. The Bureau was established in 1901 to advance the nation's science and technology and their application for the public benefit.**

Computers have become our indispensable servants for processing information and for controlling automated functions. Our economy, national security and, in fact, much of our daily routine depend upon the more than 200,000 computers used in America today.

Our Institute for Computer Sciences and Technology serves as the Federal Government focal point for computer technology activities. We provide computer standards and

guidelines and technical advisory services to improve the effective use of computers in the Federal Government. Appropriate research provides the foundation for these activities.

We welcome your interest in our Institute.

*Ruth M. Davis*



# computer security

Based on its Government-wide responsibilities to provide ADP standards, technical advice and research in computer science, ICST manages an important program in computer security. Safeguards to protect computer systems equipment, software and data are necessary for the proper and accountable use of computers in the Federal Government.

ICST computer security activities cover operating practices for the

processing of data, computer facility protection and control of access to systems and data. As part of these activities, ICST develops technical safeguards to prevent the misuse of personal information as required by the Privacy Act of 1974.

Recent products include:

- Guidelines for implementing the Privacy Act of 1974
- Guidelines for physical security and risk management to block theft

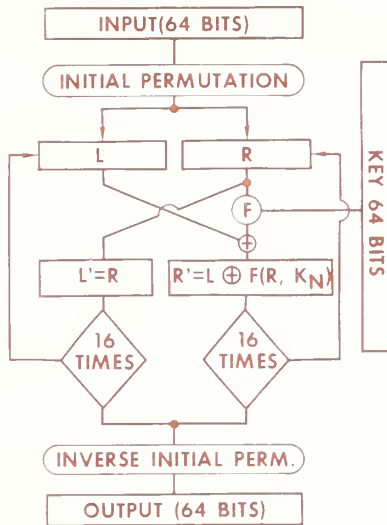
and damage to computers and data from fires and natural disasters

- Standards to protect data by encrypting it during transmission
- Guidelines on the use of identifiers such as names for accessing files
- Computer model for estimating the cost of privacy protection

Areas of current work include development of:

- Security techniques for data

## ENCRYPTION ALGORITHM



management systems and distributed data base systems

- Procedures for retrofitting computer systems for security safeguards
- Personal identification techniques for controlling access to computers
- Protection for computer networks by remote personal identification

*Computer cryptography is achieved through the use of an algorithm. This algorithm specifies the mathematical steps needed to encrypt the data. A number, called the "key," controls the encryption process. When data is encrypted, it is changed into an unintelligible form. The data is protected by keeping the key secret.*

# software management

The ICST program in Software Management helps Federal agencies improve the quality and reduce the costs of their computer software -- the programs, data files and operating practices that are required for computer operations. Computer software has become the most error-prone and the most expensive aspect of computer operations. High costs reflect the lack of automated methods for evaluating, producing and testing software. Errors in software can seriously affect public

health and safety, disrupt government operations and produce costly mistakes.

ICST develops standards and practices for computer programming emphasizing quality and efficiency, correctness of software, and economical procedures for interchanging software.

Recent products include:

- Analyzers to test and measure the quality of programs written in FORTRAN, COBOL and BASIC

- Guidelines for documentation of Federal computer programs and automated data systems
- Standards for programming language compilers, such as COBOL, FORTRAN and BASIC, that provide instructions understood by computer circuits
- Analysis of features of commercial software packages to assist in the effective use of commercially available software

# performance measurement

Effective management control of Federal computer systems and services depends upon meaningful measures of user requirements, workload demand, resource capacity, and service delivered.

The Computer System Performance Program is developing these measures for use by Federal managers through:

- Methods for the selection of computer systems and services
- Guidelines for Workload Definition and Benchmarking
- Guidelines on Computer Performance Management
- Computer performance measurement and evaluation techniques



# computer networking

The ICST program in computer networking helps Federal computer users broaden and improve their use of computer systems and terminals together with communications facilities. Computer networking makes possible the sharing of computer hardware, software and data bases and thus reduces the cost of computer operations. ICST has developed techniques that enable Federal network users to access networks more easily and to evaluate the responsiveness of different net-

works to requests for service.

Areas of current work include development of:

- Guidelines, tools, and techniques for measuring the performance of computer networks and network-based services
- Guidelines and techniques that simplify network access
- Standards and guidelines for accurately and efficiently transferring data between computer systems





# magnetic media

Magnetic media standards and measurement techniques developed by ICST provide the basis for key elements of quality control in the manufacture of magnetic media products and in their successful use. Standard reference materials and calibration services help to assure the efficient and reliable transfer of information among and within computer systems. The ICST magnetic media group develops methods and guidelines for protecting the data stored on magnetic media from

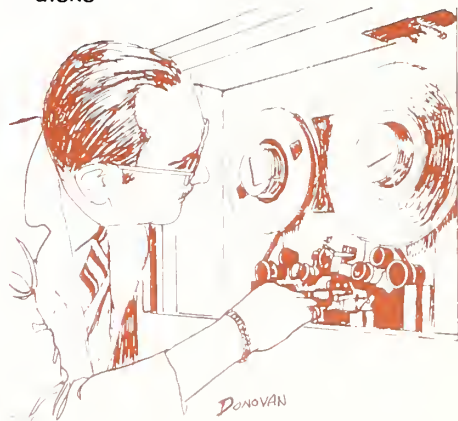
environmental damage.

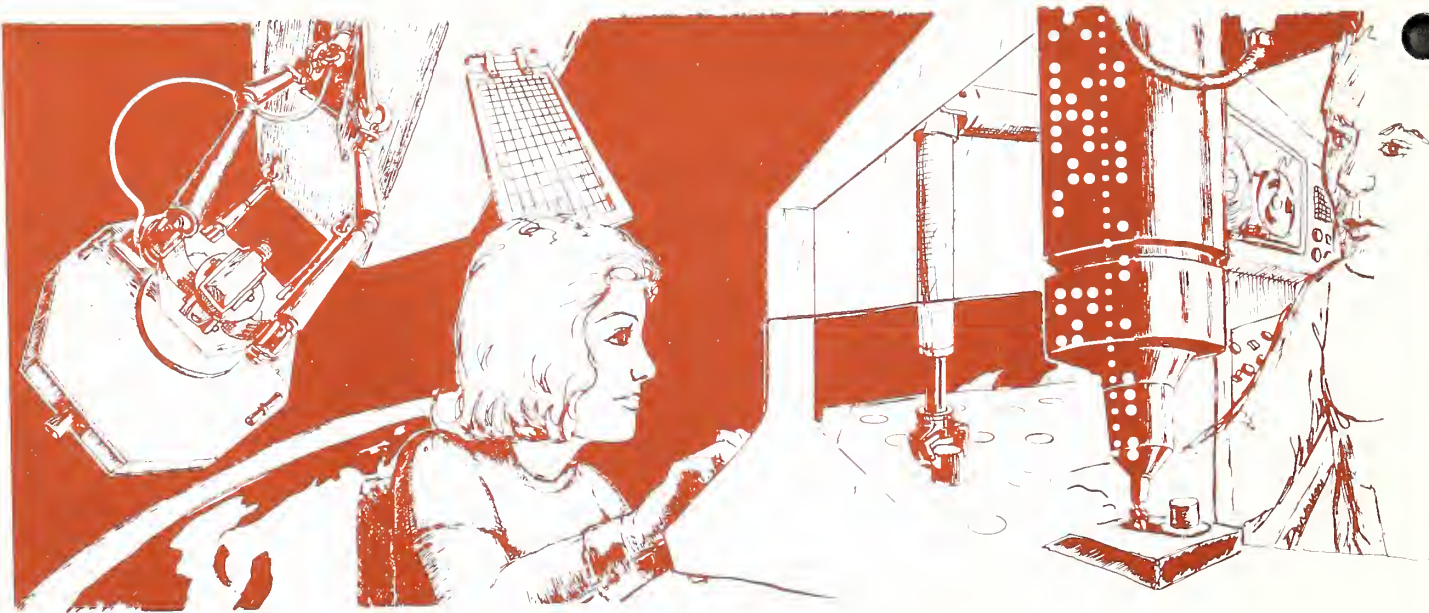
Standard Reference Materials are available for the following:

- **Secondary Standard Magnetic Tape** (Unrecorded 12.7 mm computer tape calibrated at 200, 800, 1600 and 3200 frpi)
- **Secondary Magnetic Tape Cassette** (Unrecorded 3 1/2 mm digital cassette calibrated at 1600 frpi)
- **Secondary Magnetic Tape Cartridge** (Unrecorded 6.3 mm digital cartridge calibrated at 3200 frpi)

Calibration services are available for:

- Low, medium and high density disks





# automation technology

Automation technology uses computers to assist or replace human control functions. Successful applications of automation have brought about increased productivity and improved work quality in many manufacturing and service industries. However, the lack of standards and measurement techniques often prevents the transfer of successful technology to new applications.

ICST helps other Federal agencies

and industry resolve problems in using computer-based automation systems. For instance, automatic manipulator systems have been designed to replace workers in the handling of hazardous materials such as ordnance and radioactive nuclear fuels.

Areas of current work include development of:

- Standards for computer aided manufacturing systems
- Standards for APT, a programming language for numerically controlled machine tools
- Specifications for interfaces between components in automated systems
- Performance measures for the development, procurement, and use of automation systems
- Consulting and information services to diffuse automation technology

# ADP standards management.

Incompatibilities in computer systems, networks and computer produced information impede the effective use of Federal computers. ICST manages the Government-wide program of Federal Information Processing Standards to reduce costly differences. Under ICST leadership, more than 300 computer and information processing experts from Federal agencies contribute to standards development and implementation.

Products of the Standards program:

- 56 Federal standards and guidelines for
  - **Data** (data elements, description language, characters and codes)
  - **Software** (programming languages - COBOL, FORTRAN, BASIC)
  - **Hardware and Magnetic Media** (terminals, tapes, reels, cassettes)
  - **Quality Control** (performance measurement, benchmarking)
  - **Safety and Security**
- 79 national and 86 international

standards for ADP resulting from participation in voluntary industry standards activities.

Current efforts include standards development for: computer telecommunications, component interfaces, data collection and entry, terminals, magnetic media, programming languages, software documentation and safety. Changes in Federal computer usage will stimulate new standards development areas.



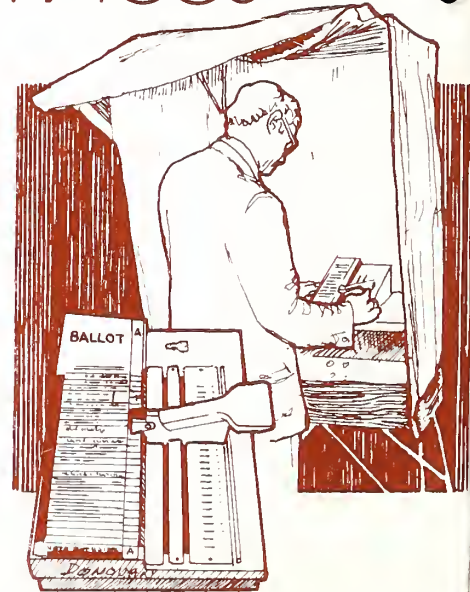
# technical advisory services

ICST technical advisory services contribute to the development of innovative applications of computer technology in other Federal agencies and to the subsequent spread of computer technology to other segments of the economy. The use of computers helps to improve the efficiency of government operations, worker productivity and the quality of working life. An extensive computer information service is provided, including a reference index to computer programs to facilitate the

sharing of computer software.


Some products of ICST advisory services are:

- Guidelines for the use of computers in elections (Office of Federal Elections)
- Techniques and engineering consulting assistance for the automated processing and matching of fingerprints (Federal Bureau of Investigation)
- Specification and prototype development of automated remittance processing system (Internal Revenue Service)





# international performance measurement



The international transfer of computer technology can benefit developing countries and contribute to the U.S. balance of trade. ICST supplies technical expertise to Federal agencies responsible for this transfer and to the Office of Export Administration in reviewing export license applications for complex computers and related equipment. The beneficial transfer of computer technology is further aided by such products of ICST as the publication *Guidelines for the Use of Computer*

*Technology in Developing Countries.*

Areas of current work include:

- Representation in international organizations concerned with computers and their applications
- Assessment of current and future international trends in computer technology
- Technical assistance to Agency for International Development in developing international workshops in computer technology

# experimental computer facility



Research and experimental projects involving the development and testing of new techniques in all ICST program areas are supported by a state-of-the-art experimental computer facility.

The facility includes:

- A medium-scale time-shared computer system
- Four minicomputers
- Terminal link to ARPA computer network
- Interactive graphics display



# publications

Special reports and technical studies are important products of the ICST program. Subject areas covered include ICST activities in ADP standards, technical advisory services and research and development.

To request a list of publications or information about the Institute for Computer Sciences and Technology, write to:

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Washington, D. C. 20234

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**Brochure designed by Dennis Donovan**

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